

NIST Community Resilience Planning Resources

Worse Case Effects of Hurricanes, Fluvial Flooding, High Tides, and Sea Level Rise on DelDOT Assets Meeting University of Delaware, Lewes, Delaware October 30, 2017

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Why Community Resilience?

- Communities are socio-technical systems
- Buildings and infrastructure enable social and economic function
- Social and economic needs and functions should drive the goals for performance of buildings and physical infrastructure
- All communities are exposed to hazards that can cause disruption to social and economic activity





Challenges

- What should the community be resilient to?
- How to account for interconnected nature of social systems, buildings, and infrastructure?
- How to identify performance gaps ("measure") resilience?





What is Resilience?

- "the ability to prepare for and adapt to changing conditions and to withstand and recover rapidly from disruptions. Resilience includes the ability to withstand and recover from deliberate attacks, accidents, or naturally occurring threats or incidents." (PPD 21)
- Resilience can be thought of as what desired recovery looks like, expressed in terms of "time to recover function."



NIST Community Resilience Program

Stakeholder Engagement*

Community Resilience Planning Guide

Community Resilience Panel

Community Resilience
Guide Briefs

Research

Community Resilience Systems Model

Community Resilience Assessment Methodology

Economics-based Decision Support Tool

Center of Excellence

Integrated, multiscale modeling

> Database Architecture

Pilot Studies

Community Resilience Fellows

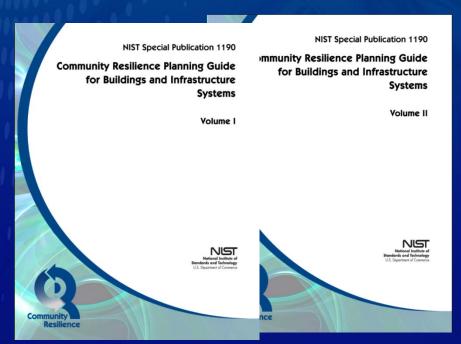


Planning Guide Outline

Volume 1 - Methodology

Executive Summary

- Introduction
- 6 Step Methodology
- Planning Example Riverbend
- Glossary and Acronyms



Volume 2 - Reference

Executive Summary

- Social Community
- Dependencies and Cascading Effects
- Buildings
- Transportation Systems
- Energy Systems
- Communications Systems
- Water & Wastewater Systems
- Community Resilience Metrics



Planning Steps for Community Resilience

SIX-STEP GUIDE TO PLANNING FOR COMMUNITY RESILIENCE



FORM A COLLABORATIVE PLANNING TEAM

- · Identify leader
- · Identify team members
- · Identify key stakeholders





UNDERSTAND THE SITUATION



- · Characterize social functions & dependencies
- · Identify support by built environment
- · Identify key contacts



- · Identify and characterize built environment
- · Identify key contacts
- · Identify existing community plans

Link Social Functions & Built Environment

· Define clusters



DETERMINE GOALS & OBJECTIVES

- · Establish long-term community goals
- · Establish performance goals
- · Define community hazards
- · Determine anticipated performance
- Summarize results







- · Identify solutions
- · Develop implementation strategy



PLAN PREPARATION, REVIEW, AND APPROVAL

- · Document plan and strategy
- · Obtain feedback and approval
- · Finalize and approve plan





PLAN IMPLEMENTATION AND MAINTENANCE

- · Execute approved solutions
- Evaluate and update
- · Modify strategy as needed







Example Matrix: Building Performance Goals

		Design Hazard Performance									
Building Clusters	Support Needed ⁴		Phase 1		Phase 2			Phase 3			
		Short-Term			Intermediate			Long-Term			
			Days		Weeks			Months			
		0	1	1-3	1-4	4-8	8-12	4	4-24	24+	
		Building Performance Category									
		A			В			С		D	
Critical Facilities											
Emergency Operation Centers	R, S, MS	90%							X		
First Responder Facilities	R, S, MS	90%							X		
Memorial Hospital	R, S, MS	90%							X		
Non-ambulatory Occupants (prisons, nursing homes, etc.)	R, S, MS	90%							X		
National Aircraft Parts Factory (NAP)	R, S, C	90%							X		
Emergency Housing											
Temporary Emergency Shelters	R, S	30%	90%							X	
Single and Multi-family Housing (Shelter in place)	R, S	60%			90%					X	
Housing/Neighborhood											
Critical Retail	R, S, C		30%	60%	90%					X	
Religious and Spiritual Centers	R, S			30%	60%	90%				X	
Single and Multi-family Housing (Full Function)	R, S			30%		60%		90%		X	
Schools	R, S			30%	60%	90%				X	
Hotels & Motels	R, S, C			30%		60%	90%			X	
Community Recovery											
Businesses – Manufacturing (except NAP)	R, S, C				30%	60%	90%			X	
Businesses - Commodity Services	R, S, C				30%	60%		90%		X	
Businesses - Service Professions	R, S, C				30%		60%		90%	X	
Conference & Event Venues	R, S, C				30%		60%		90%	X	



Example Matrix: Transportation Infrastructure

		Design Hazard Performance									
Transportation Infrastructure	Support Needed ⁴	Phase 1 Short-Term			Phase 2 Intermediate			Phase 3 Long-Term			
		0	1	1-3	1-4	4-8	8-12	4	4-24	24+	
	Ingress (goods, services, disaster relief)										
Local Roads	R, S	60%	90%	X							
State Highways and Bridge	R, S	60%	90%		X						
Regional Airport	R, S		30%	60%	90%		X				
Egress (emergency egress, evacuation, etc.)											
Local Roads	R, S	60%	90%	X							
State Highways and Bridge	R, S	60%	90%		X						
Regional Airport	R, S		30%	60%	90%		X				
Community resilience											
Critical Facilities											
Hospitals	R, S	60%	90%	X							
Police and Fire Stations	R, S	60%	90%	X							
Emergency Operational Centers	R, S	60%	90%	X							
Emergency Housing											
Residences	R, S	30%	60%	90%	X						
Emergency Responder Housing	R, S	30%	60%	90%	X						
Public Shelters	R, S	90%		X							
Housing/Neighborhoods											
Essential City Service Facilities	R, S	30%	60%	90%	X						
Schools	R, S	30%	60%	90%	X						
Medical Provider Offices	R, S	30%	60%	90%	X						
Retail	R, S	30%	60%	90%	X						
Community Recovery											
Residences	R, S	30%	60%	90%	X						
Neighborhood retail	R, S	30%	60%	90%	X						
Offices and work places	R, S	30%	60%	90%	X						
Non-emergency City Services	R, S	30%	60%	90%	X						
All businesses	R, S		30%	60%	90%	X					



Example Summary Resilience Matrix

Infrastructure	Recovery Time										
Critical Facilities	Days 0	Days 1	Days 1-3	Wks 1-4	Wles 4-8	Wks 8-12	Mos 4	Mos 4-24	Mes 24+		
Buildings Transportation Energy Water Wastewater Communication	90%	90% 90% 90%	X X 90%	90% X	X			x)		
Emergency Housing Buildings Transportation Energy Water	Desired No.					Anticipated Performance					
Waste Water Communication				90%	X						
Housing/Neighborhoods Buildings Transportation			90%	X X		90%			X		
Energy Water Waste Water			90%	90%	90%			X X			
Community Recovery Buildings				90%	x		Х	90%	X		
Transportation Energy Water Waste Water			90%	90% X 90%	X		90%	x			
Communication				90%			X				



Economic Decision Guide (EDG)

- Provides a standard methodology for evaluating investment decisions aimed at improving a community's resilience
- Designed for use with NIST's Community
 Resilience Planning Guide for Buildings and
 Infrastructure Systems but can be used
 alone
 - Mechanism to evaluate <u>efficiency</u> of resilience actions and to <u>prioritize</u> them
- Frames the economic decision process
 - Identifies and compares resilience-related benefits and costs
 - Across competing alternatives
 - Versus the status quo (do-nothing)

NIST Special Publication 1197

Community Resilience Economic Decision
Guide for Buildings and Infrastructure
Systems

Stanley W. Gilbert
David T. Butry
Jennifer F. Helgeson
Robert E. Chapman



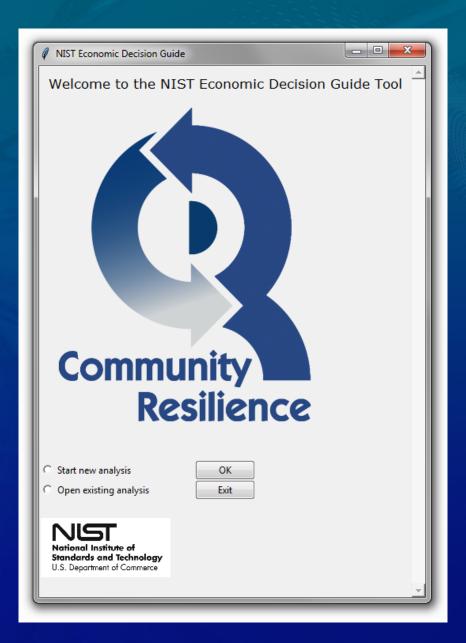
http://dx.doi.org/10.6028/NIST.SP.1197





EDGeS Tool

- Helps to use the NIST Economic Decision Guide and assist decision makers with resilience planning efforts
- Programmed in Python and packaged as an .exe
 - Ability to use "offline"
 - Possible plug-in to a GIS platform





Using the Guide

- Encourage use of the Guide for community resilience planning.
- Collect data on its use to inform future versions of the Guide and other products.
- Current uses include:
 - Fort Collins, Colorado
 - Boulder Country, Colorado
 - Delaware Department of Transportation
 - San Diego/Tijuana Earthquake Scenario
 - Others!





NIST Contact

Website:

http://www.nist.gov/el/resilience/

Guide:

http://www.nist.gov/el/resilience/guide.cfm

Or google "NIST Resilience Planning Guide"

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